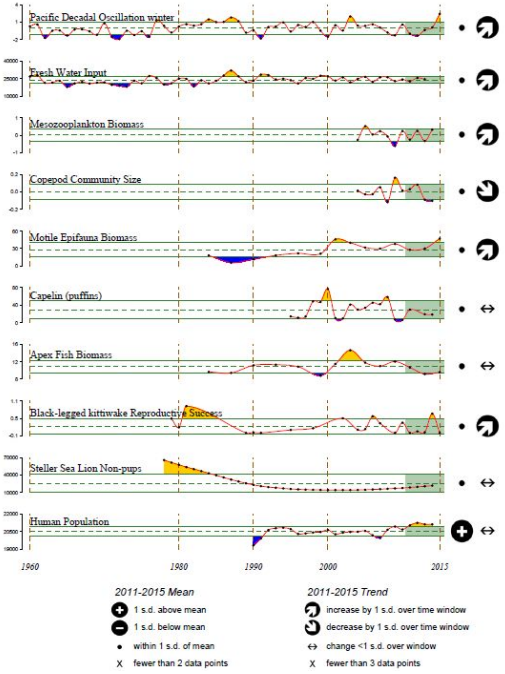
NOAA FISHERIES

Alaska Fisheries Science Center

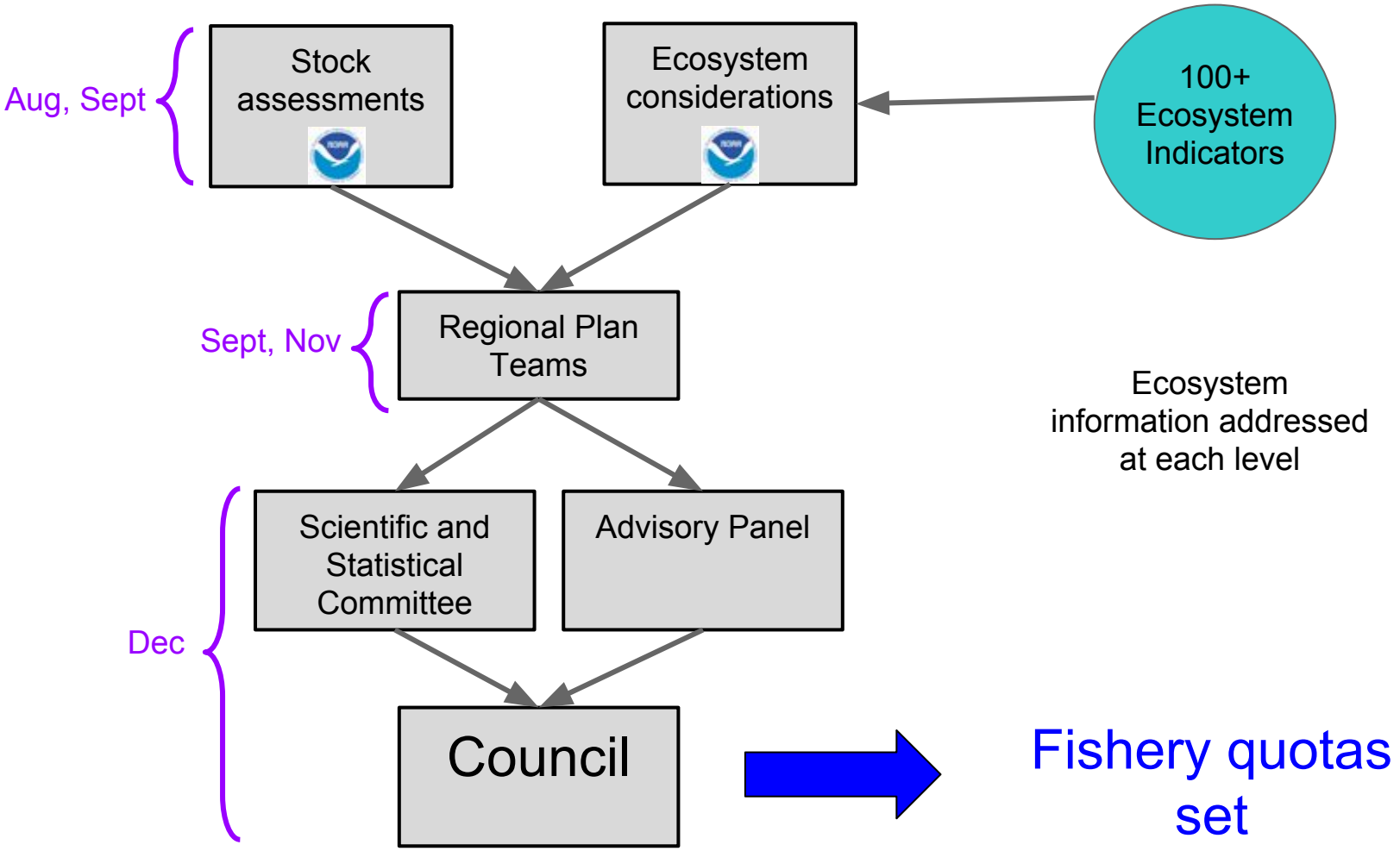
The Gulf of Alaska Report Card



Stephani Zador

Ecosystem Science Review
Juneau, Alaska
May 2-6, 2016

Background: Ecosystem information is formally incorporated into the annual Council process



Ecosystem Considerations Report History

- Produced annually since 1995
- Evolved since then
  - 1995: *a compendium of general information on EBS, AI and GOA ecosystems and a general discussion of ecosystem-based management.*
  - 2015: Report Cards, Hot Topics, assessments, indicators, etc.
- Adaptive document
  - Revised annually in response to review and new information available
  - New indicators every year

Ecosystem Considerations 2015

Status of Alaska's Marine Ecosystems

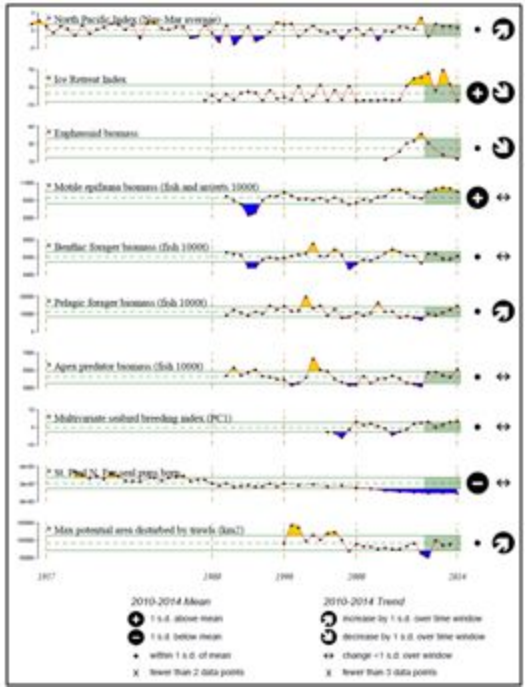
Edited by:
Stephani Zador
Resource Ecology and Fisheries Management Division, Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA
7600 Sand Point Way NE
Seattle, WA 98115

With contributions from:

Kerim Aydin, Sonia Batten, Nick Bond, Kristin Cieciel, Annette Dougherty, Miriam Doyle, Lisa Eisner, Ed Farley, Emily Ferguson, Nissa Ferm, Lowell Fritz, Jeanette Gann, Angie Greig, Dana Hanselman, Colleen Harpold, Al Hermann, Kirstin Holsman, Jim Ianelli, John Joyce, Kathy Kuletz, Elizabeth Labunski, Carol Ladd, Bob Lauth, Jean Lee, Mike Litzow, Ana Matarese, Kathryn Mier, Jamal Moss, Franz Mueter, Jim Murphy, John Olsen, Joe Orsi, Ivonne Ortiz, Jim Overland, Sigrid Salo, Kalei Shotwell, Elizabeth Siddon, William Stockhausen, Kathryn Sweeney, Scott Vulstek, Muyin Wang, Alex Wertheimer, Andy Whitehouse, Tom Wilderbuer, Matt Wilson, Ellen Yasumiishi, and Stephani Zador

Reviewed by:
The Plan Teams for the Groundfish Fisheries of the Bering Sea, Aleutian Islands, and Gulf of Alaska

November 16, 2015
North Pacific Fishery Management Council
605 W. 4th Avenue, Suite 306
Anchorage, AK 99501



The Ecosystem Considerations Report

- LME-scale assessments
- Targeted for managers
- Linked with stock assessments
- Provides context for EAF/EBFM

Ecosystem Considerations 2015

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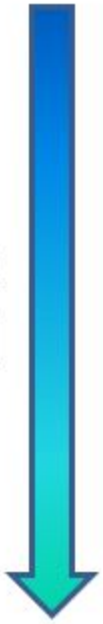
Integrative ecosystem assessments for each LME bridge detailed indicators and short report cards

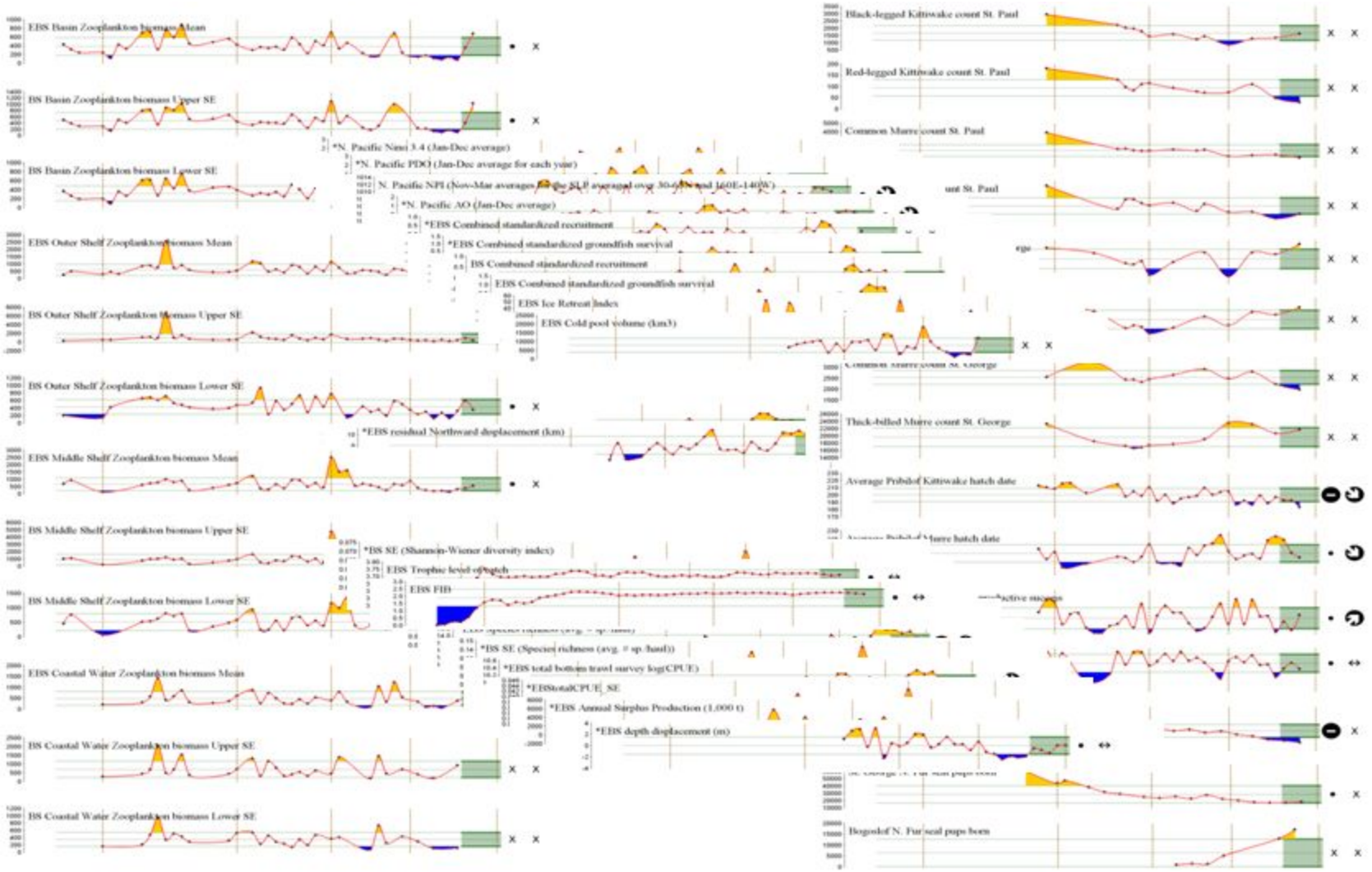
Increasing level of detail



Major Sections (2015 report, 297 p)

- Report Cards (10 p)
  - Eastern Bering Sea, Aleutian Islands
  - Gulf of Alaska in development
- Ecosystem Assessment (45 p)
  - Eastern Bering Sea, Aleutian Islands
  - Preliminary Arctic, Gulf of Alaska
- Ecosystem Status and Management Indicators (179 p)
  - 50 (8 new)

Myriad ecosystem indicators includes survey data, model estimates and forecasts



What makes a good indicator?

- Knowing what the indicator indicates
  - E.g., functional responses, recruitment strength
  - Sensitive
- Useful for management
  - Requires understanding the management system
  - Matches management scale, temporally and spatially
  - Frequent dialogue, adaptive

Report Cards reduce annual ecosystem data into single pages

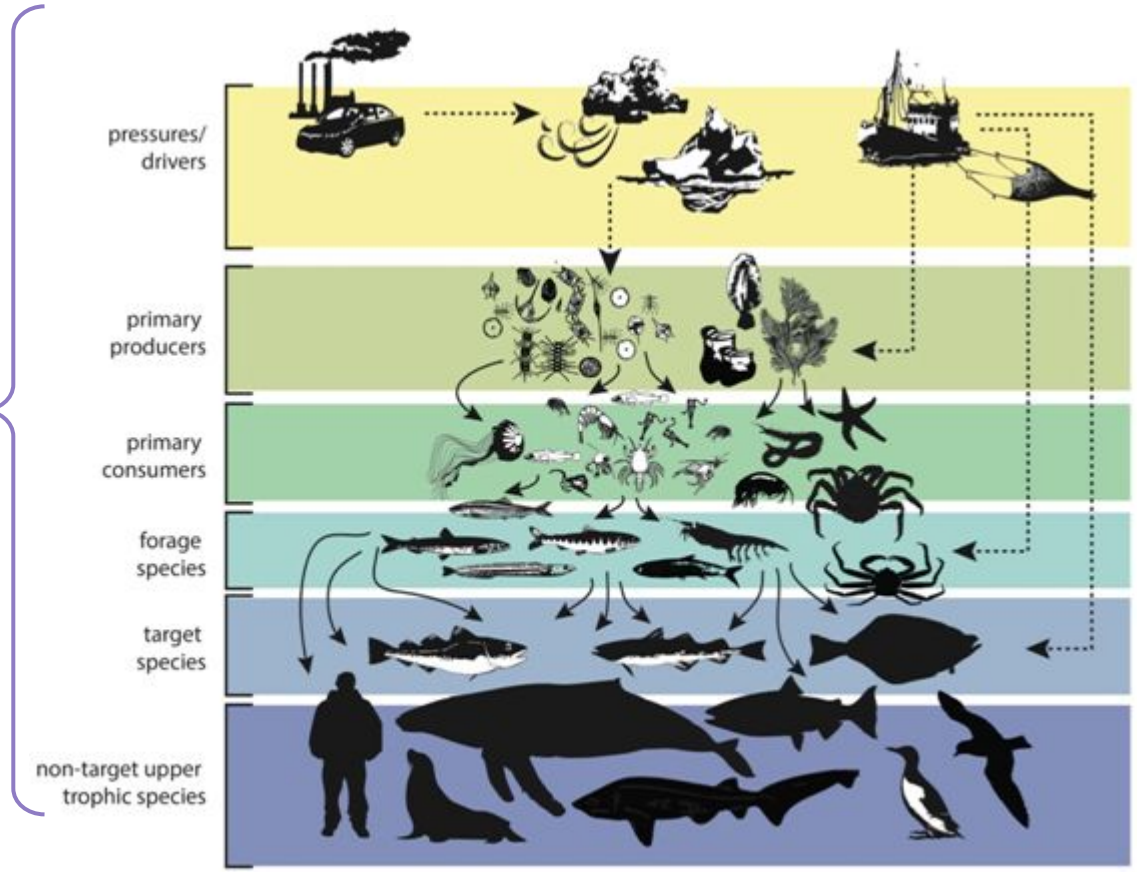
Gulf of Alaska Report Card

Goal - Methods - Process

- Select “top” 8-10 indicators that best represent the complexity of the GOA ecosystem (as in the EBS, AI)
- Team of experts voted via online survey (to broaden expertise)
- 44 experts participated (agency, academic, other)
- Paperwork Reduction Act

Gulf of Alaska Report Card Indicator Categories

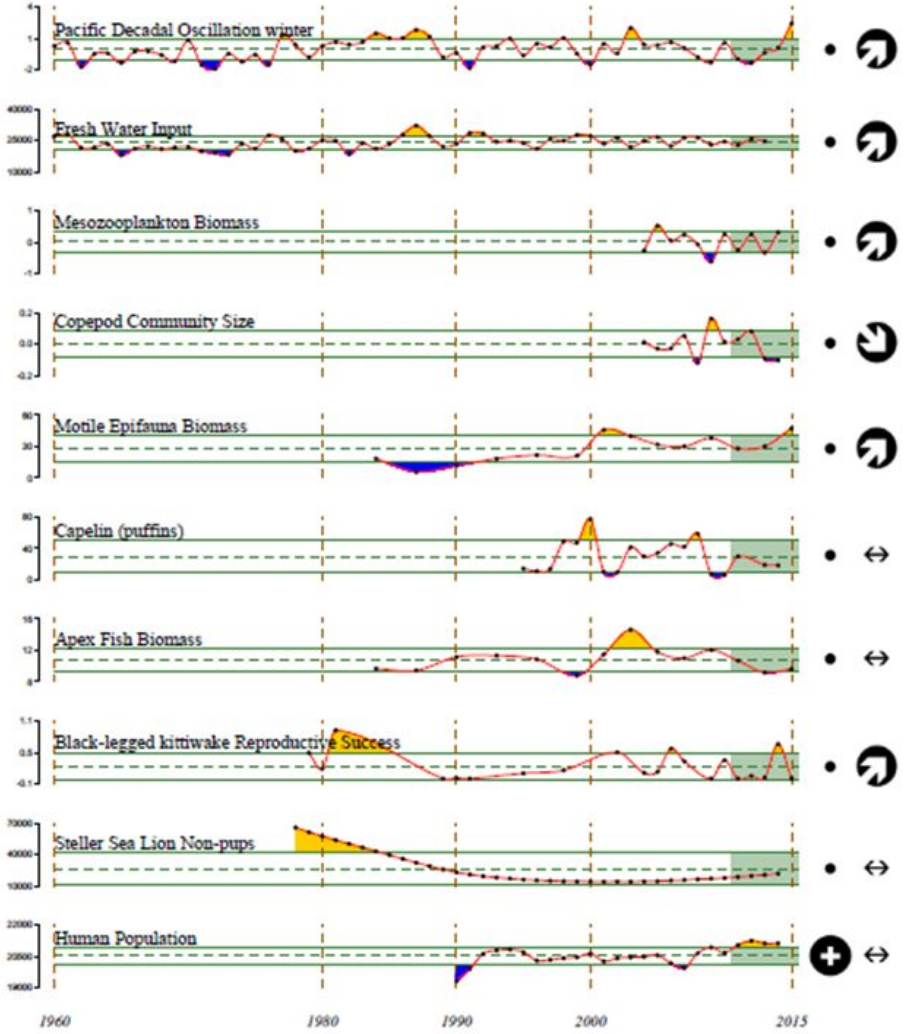
1. Climate
2. Oceanography
3. Zooplankton
4. Benthic fauna
5. Forage fish
6. Other fish
7. Seabirds
8. Marine mammals
9. Humans



2015 Preliminary Gulf of Alaska Report Card

Physics <-> Fish <-> Humans

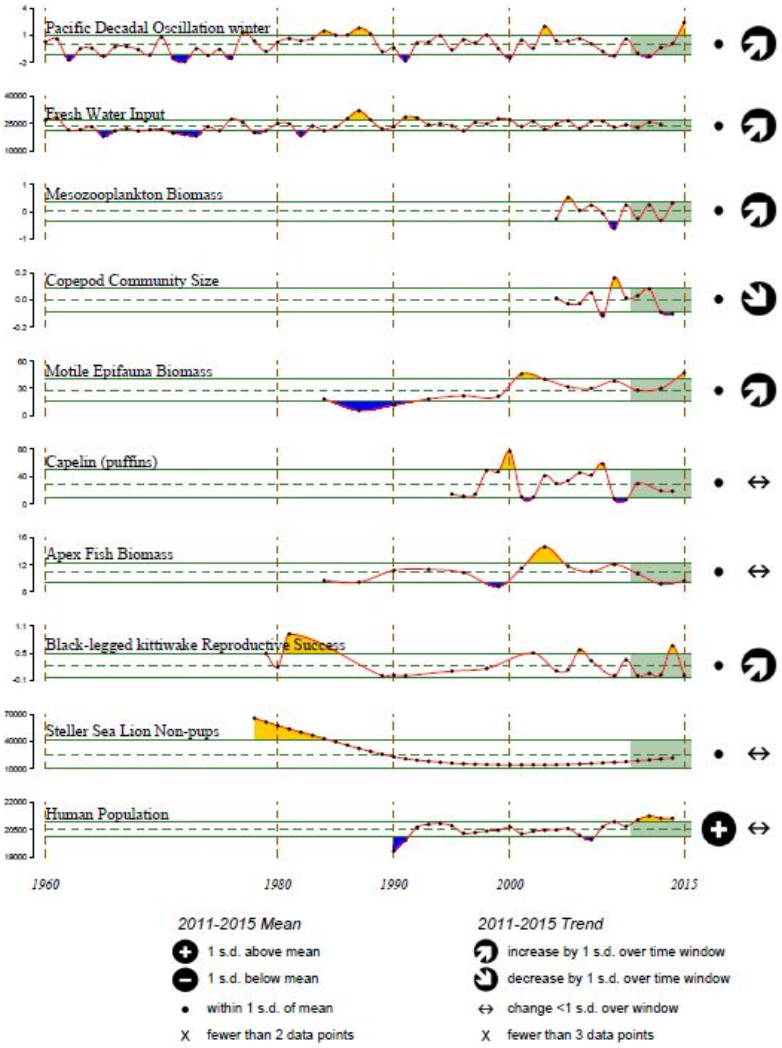
1. PDO
2. Fresh Water Input
3. Mesozooplankton
4. Copepod Size
5. Motile Epifauna Biomass
6. Capelin
7. Apex Fish Biomass
8. Kittiwake Reproductive Success
9. Steller Sea Lions
10. Human Population



Bulleted text and standard time series format present concise summary of ecosystem status

Gulf of Alaska 2015 Report Card

- The Gulf of Alaska in 2015 was **characterized by warm conditions** that were first seen in 2014, and continued through the winter, during which **the PDO reached the highest winter value seen** in the record extending back to 1900.
- **Fresh water input as estimated at the GAK1 station has been variable** over the long time series. The most recent data indicate an increasing trend.
- **Mesozooplankton biomass measured by the continuous plankton recorder has shown a biennial trend since 2009**, with higher biomass recorded during even-number years. Biomass trends can be influenced by ecosystem conditions and mean size of the community. This suggests that prey availability for planktivorous fish, seabirds, and mammals has been variable recently. The biennial patterns suggests a **possible link with biennially varying planktivorous pink salmon abundance**.
- **Copepod community size has been declining in recent years**. The prevalence of small copepods during 2014 fits predictions of warm conditions favoring small copepods. This suggests that **less lipid-rich prey were available to planktivorous predators**.
- **Survey biomass of motile epifauna** has been **above its long-term mean** since 2001. The increase from 1987 to 2001 was driven by hermit crabs and brittle stars, which dominate the biomass. Since 2001 their biomass has been stable. Record catches of octopus influenced the increased estimate in 2015.
- **Trends in capelin captured by tufted puffins at the Barren Islands have been variable** in the 20 year time series. **Capelin comprised the majority of chick diets in 2000 and were generally abundant from 2003 - 2008, but have been at or below the mean since that time**. It is unknown whether these trends reflect capelin abundance or prey preferences of the puffins.
- **Fish apex predator survey biomass is currently below its 30-year mean**, although the declining trend seen in recent years has leveled off. **The trend is driven primarily by arrowtooth flounder** which, along with halibut, had been declining since 2005. Both increased slightly in 2015. It is unknown whether these increases were due to distributional shifts in the warm water. **Pacific cod has declined from a peak survey biomass in 2009**.
- With the exception of 2014, **black-legged kittiwake reproductive success has been poor** in the Semedi Islands, indicating that conditions were not favorable for these surface-foraging piscivorous seabirds. This may reflect poor conditions prior to the breeding season, during, or both.
- Modelled estimates of total Gulf of Alaska **Steller sea lion non-pups counts are approaching the long term mean**. This slowly increasing pattern since 2000 reflects the combination of increasing trends in the eastern population with declining trends in the western popoulation.
- Human populations in the Gulf of Alaska coastal towns of **Homer, Kodiak, Sitka, and Yakutat are above their 25 year mean**. Homer is the sole town with a steadily increasing trend. Kodiak saw declines until 2006 and has recovered slightly since then.



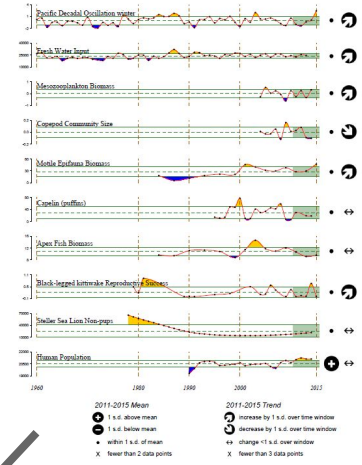
But there is complexity

In the Gulf of Alaska, local scale processes may swamp basin-wide signals

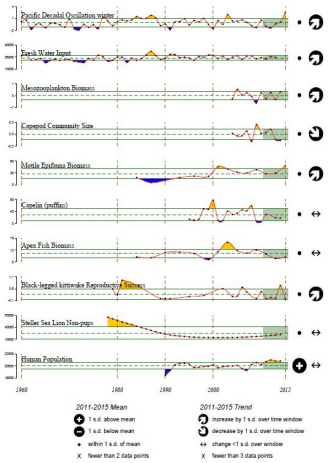
Report Card Review and Refinement

- Council SSC “very pleased”, commended the broader base for selection process and support continued refinement

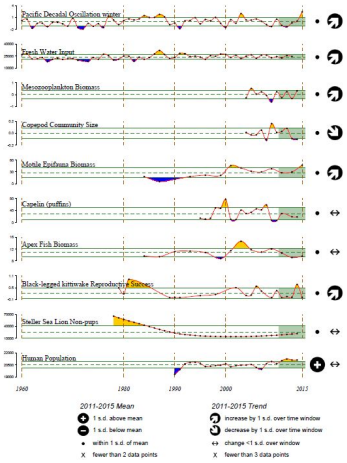
- GOA IERP Synthesis Workshop
  - Divided Report Cards into East and West regions
  - Support more model-derived indicators (fresh water input, forage fish, etc)



WEST GOA



EAST GOA

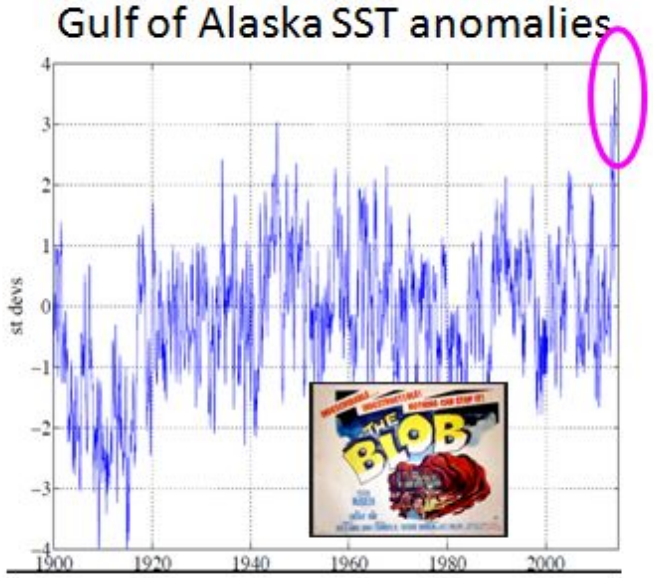


Inclusion of ecosystem data into living marine resource management advice

- Spurs discussion
- Provides context for EBFM

Discussion can influence the quota-setting process

As we build modeling and predictive capacity, we will still need qualitative synthesis to capture events outside the bounds of current models and to detect impacts of the unexpected



How was this inclusion decided? (TOR 6)

- SSC request
- Gap analysis
  - workshops/panels
- Individual requests
  - work with scientists to turn results into indicators
- Indicators are curated (“pruned”)

How was this inclusion decided? (TOR 6)

From Council minutes, December 2006:

"The [eastern Bering Sea walleye pollock] stock remains above the MSY level, having declined … at a rate of about 19% per year….

Result from stock assessment

Other issues raised … suggest a need for further caution.

- a northward shift … with some portion of the population into Russian waters.

Assessment + ecosystem indicators

- a large decline in zooplankton, which is important in providing forage for juvenile pollock.

Ecosystem indicators

- increasing predation by arrowtooth flounder on juvenile pollock.

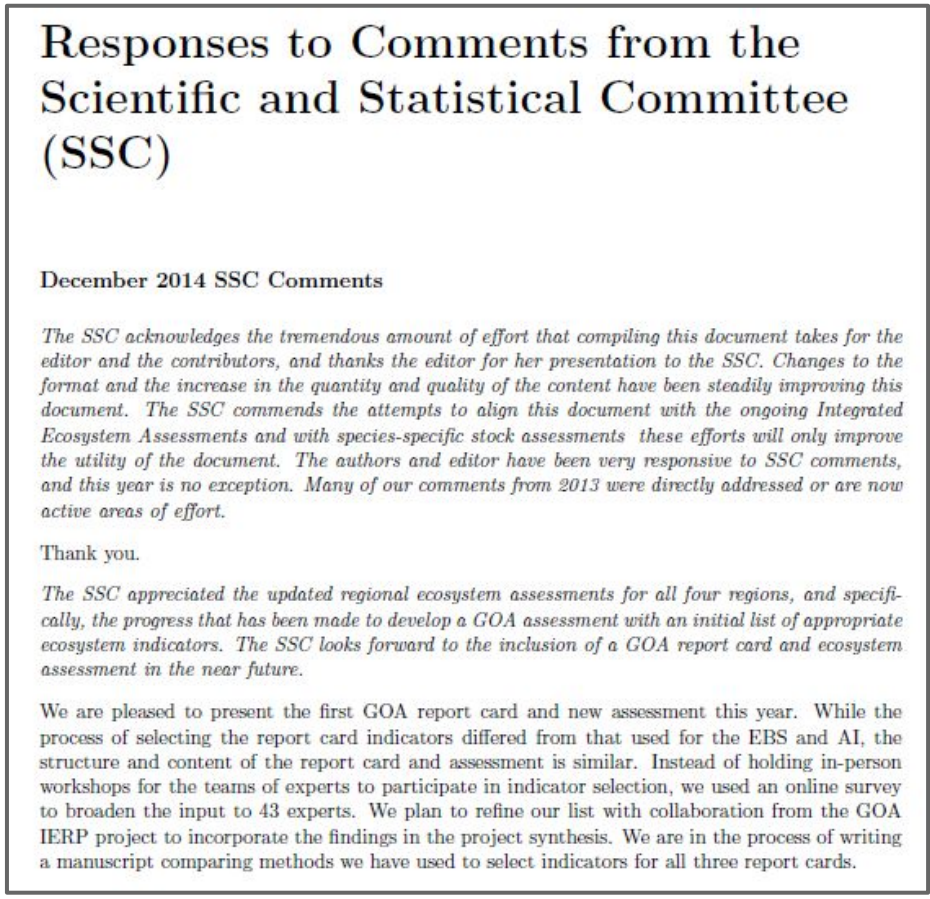
Multispecies model

Consequently, … a reduction in … catch … is justified."

Peer-review of ecosystem-related science program and products (TOR 7)

Peer-review relative to purpose and use:

- Annual review by the Council Plan Teams and Scientific and Statistical Committee
- Expert solicitation for GOA Report Card indicators (2014-2015)
- Review of preliminary Report Card by Council (Fall 2015)
- Review/Refinement by GOA IERP Synthesis Team (March 2016)



Responses to Comments from the Scientific and Statistical Committee (SSC)

December 2014 SSC Comments

The SSC acknowledges the tremendous amount of effort that compiling this document takes for the editor and the contributors, and thanks the editor for her presentation to the SSC. Changes to the format and the increase in the quantity and quality of the content have been steadily improving this document. The SSC commends the attempts to align this document with the ongoing Integrated Ecosystem Assessments and with species-specific stock assessments these efforts will only improve the utility of the document. The authors and editor have been very responsive to SSC comments, and this year is no exception. Many of our comments from 2013 were directly addressed or are now active areas of effort.

Thank you.

The SSC appreciated the updated regional ecosystem assessments for all four regions, and specifically, the progress that has been made to develop a GOA assessment with an initial list of appropriate ecosystem indicators. The SSC looks forward to the inclusion of a GOA report card and ecosystem assessment in the near future.

We are pleased to present the first GOA report card and new assessment this year. While the process of selecting the report card indicators differed from that used for the EBS and AI, the structure and content of the report card and assessment is similar. Instead of holding in-person workshops for the teams of experts to participate in indicator selection, we used an online survey to broaden the input to 43 experts. We plan to refine our list with collaboration from the GOA IERP project to incorporate the findings in the project synthesis. We are in the process of writing a manuscript comparing methods we have used to select indicators for all three report cards.

Communication to managers, partners, stakeholders and the public (TOR 8)

Website:
- Updated 2016
- Improved data access

Presentations to Council:
- 7 - 8 per year

Presentations:
- Other Councils
- NGO
- Scientific conferences
- Industry

General public:
- e.g., Pew, Nat Geo stories